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Some Aspects of Bovine Teat Surgery*

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A BRIEF REVISION OF THE ANATOMY AND PHYSIOLOGY OF THE COW'S MAMMARY GLANDS

The mammary glands in all mammalia are cutaneous glands but are so closely allied functionally with the genital organs as to be regarded as accessory to them.

In the cow they are normally two in number and the body of each is ellipsoidal in form, flattened transversely. The base of each gland is slightly concave and slopes downwards and forwards on the abdominal wall to which it is adherent. The large supramammary lymphatic glands are situated just posterior to the inguinal vessels as the latter emerge from the external inguinal ring and between the lateral suspensory ligaments on the postero-dorsal surface of the udder. The medial surface is flattened and separated from the other gland by a well-developed double septum. The lateral surface is convex. Four well-developed teats are usually present. It is customary to consider the udder as consisting of "four quarters." There is no septum or visible division between the two quarters of the same side, but on the other hand injections of fluid of different colours into two teats of one gland demonstrate that the cavities drained by them do not communicate. The mammary arteries are derived from the external pudic arteries. The prepubic artery arises usually by a common trunk with the deep femoral a little below the level of the pubis. At the internal inguinal ring it divides into the posterior abdominal and external pudic arteries. The latter descends the inguinal canal in its posterior commissure and divides into the subcutaneous abdominal artery and the mammary artery which enters the base of the mammary glands in which it ramifies.

The veins form a circle at the base of the udder from which the blood is drained by three trunks, *viz.*, the very large subcutaneous abdominal vein (milk vein), the external pudic and the perineal vein. Lymph vessels are numerous and pass chiefly to the supramammary lymph glands.

The nerve supply to the udder and teats has three sources: the inguinal nerves, the sympathetic nerves and the cutaneous nerves.

The inguinal nerves are derived from the free anastomosis of the ventral branches of the lumbar spinal nerves. They pass down the inguinal canal and then give off many branches which are distributed to the glandular tissue, milk collecting system and teats as satellites of the ramifying arteries (Mack. A. Emerson, Studies of the Microscopic Anatomy of the Bovine Udder and Teat).

The sympathetic innervation of the udder comes from the posterior (caudal) mesenteric plexus *via* the inguinal nerve trunks.

The cutaneous nerves originate from the ventral branches of the first lumbar spinal nerve, the plexus of nerves from the ventral branches of the second and the third lumbar spinal nerves, and possibly from the ventral branch of the last thoracic spinal nerve (Mr. C. W. Ottaway says he has been unable to find this last root).

Each teat is a membranous tube, conical in outline, with its base joining the udder, and consists largely of bundles of unstriped muscle tissue and blood vessels arranged more or less longitudinally and held loosely together by fibrous tissue. Near the free extremity or apex the muscle bundles are arranged in a circular manner around the duct to form a sphincter. The length of the teat varies considerably, increasing with the number of lactations through which the cow has passed. There is but little variation in the thickness of the wall from the base to the apex: it varies in different species and at different ages from ¼ to 1 cm. in thickness.

The lumen of the teat is divisible into two parts:—

1. The teat sinus (or cavity of the teat) which is really a downward extension of the lactiferous sinus.
2. The duct or streak canal, which drains the sinus and opens at the free end of the teat.

The structure of the teat wall from without inwards is: skin, connective tissue, muscle, lymphatic and blood vessels, nerves and mucous membrane.

(*a*) The skin of the teat is hairless and free from sebaceous and sudoriferous (sweat) glands. The epidermis may be pigmented throughout its length or only partially. It is abundantly supplied with blood vessels, a circumstance which explains the ease with which slight injury to the epidermis results in bleeding.

(*b*) The next layer consists mainly of bundles of unstriped muscle fibres, for the most part running longitudinally but at the apex assuming a circular direction and forming a sphincter. Blood vessels are abundant in this layer and the veins, which are characterised by their large size and thick walls, for the most part run vertically in the teats. There is a well marked plexus of lymph vessels which, according to Tagand, has the property of a lymphatic corpus cavernosum which becomes turgescent in the cow's teat during suckling and manipulation.

(*c*) The mucous membrane of the teat sinus: one of the most striking features observed on opening the teat canal is the presence of folds variable in number and size. They may be confined to the lower part or extend the whole length of the sinus (Johnson, T., *J. comp. Path.*) and they course mainly longitudinally towards the upper part of the sinus.

The lining membrane of the sinus is a thin and delicate structure with an epithelium consisting of one or two layers of cells. The superficial cells are columnar or cubical and the deep cells flattened. In some teats the lining membrane of the sinus shows a number of pouches about ¼ in. deep, occasionally deeper, which may represent aborted glandular offshoots.

The teat duct, or streak canal, has a stratified squamous epithelium which is variable in thickness. At the external opening the epithelium merges inperceptibly into that of the skin. The epithelium terminates abruptly at the internal opening of the duct, frequently presenting a number of variable projections, forming what has been described as a "rosette."

ANATOMICAL ANOMALIES OF THE UDDER AND TEATS

(*a*) Partial amastia (absence of gland substance) or partial athelia (absence of teats) may occur. The author has seen cases in which only two or three teats drained the udder. The cows appeared to be quite normal otherwise and gave a good quantity of milk, in fact the owners stated that the absence of the one or two teats did not make any difference to the yield expected from the same type of cow with four quarters. It has been stated by Emmerson that in the case of an udder drained by three teats, the teat draining the half contains two ducts and sometimes a vertical groove, which suggests that such a teat is the result of fusion. The author has observed this in two cases.

(*b*) Polythelia and Polymastia. Small accessory teats occur in about 33% of dairy cattle. Usually these accessory teats are situated posteriorly to the normal teats. Occasionally they are found between the four normal teats and very occasionally they are anterior to the normal ones. Not uncommonly they are attached to the normal ones. These teats are frequently rudimentary and imperforate but sometimes they drain a small amount of gland substance—"Polymastia."

ANAESTHESIA AND RESTRAINT FOR TEAT SURGERY

A review of the origin of the sensory nerve supply to the udder to some extent rules out the use of epidural anaesthesia for teat surgery. Very large doses of local anaesthetic (70 to 130 c.c.) have to be used to obtain effective anaesthesia. The disadvantages are at once apparent in that the animal would be recumbent for some time and the cost of the anaesthetic would have to be reckoned with. The author has made use of field anaesthesia (the blocking of an area of skin by linear infiltration of its margins) and has had very satisfactory results. Although paravertebral anaesthesia (nerve block) would appear to offer possibilities, the technique of its administration is much more difficult than that of "field anaesthesia." J. Farquharson, who introduced the method of paravertebral anaesthesia in bovines, claims that this form of anaesthesia is quicker to effect than field infiltration.

In the operations to be described, when anaesthesia is necessary, field anaesthesia would be employed and the best instrument to effect this is the 1 c.c. dental syringe frequently used for intradermal tuberculin injections, with a needle about 5 mm. long and 0·5 mm. thick. In order to induce this form of anaesthesia the animal should be restrained by an assistant holding the nose and a rope or kicking strap applied above the hocks, or better with the tail raised vertically.

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When the anaesthetic (1 per cent. novutox) has been injected, at least ten minutes should be allowed to elapse before interference is commenced. Now the surgeon must decide whether he prefers to carry out the operation in the standing or recumbent position, only non-pregnant animals being cast. If the animal is to be cast administration of one ounce of chloral hydras in a pint of milk before making the local injections will be found to be of considerable assistance. After the lapse of time for the anaesthetic to take effect the animal should be cast by Reuff's method, omitting the loop at the base of the neck.

Polythelia (Supernumerary Teats)

The best time to deal with these is when the heifer calf is a few days old. This simple operation is frequently carried out by breeders of pedigree stock themselves without veterinary advice. If a veterinary surgeon is called upon to do it, a careful examination of the position of the teats should be made, remembering that supernumerary teats are usually posterior. After cleansing the area with spirit, the supernumerary teats may be snipped off close to the udder with a pair of sterile scissors, taking care to remove the teats as near the udder as possible. No suturing is necessary and the prognosis is very good. If unfortunately the offending accessory teats are noticed by the owner only when the heifer is some seven to eight months pregnant and the accessory teats are not attached to normal ones, then it may be decided to leave them alone, but if attached, then, unless they are removed upon the commencement of lactation, it will be found that milk flows from the normal and accessory teats of the same quarter. This will detract considerably from the market value of the heifer. In such a case the following procedure is necessary but the operation should not be attempted if the heifer is within 14 days of the end of gestation.

Instruments required: intradermal syringe, scissors, rat-toothed forceps, needles, silk-worm gut (these are, of course, sterilised).

The heifer is restrained by either of the methods previously suggested. After cleansing the area with spirit field anaesthesia is carried out above and at the sides of the accessory teat or teats in the form of a V with the apex towards the udder. Ten minutes is given for the local anaesthetic to act; the area is again cleansed with spirit and the surgeon, having thoroughly cleansed his hands, takes a pair of sterile scissors and removes the offending accessory teat as close to the normal one as possible. Depending upon the stage of pregnancy, at this stage of the operation honey-like material escapes from the quarter when the teat is removed. The wound left in the normal teat is now sutured with silk-worm gut, and the needle is passed through the skin about ½ to 1 cm. from the edge of the incision. From here it goes into the substance of the teat wall down to, but not through, the mucous membrane, thence across to the opposite side of the wound and back out through the skin on the opposite side in the reverse order. The needle is now passed through the skin 2 to 3 mm. from the edge of the incision on the same side, straight across to the opposite side of the wound and out through the skin on this side from 2 to 3 mm. from the edge of the incision. Some two, three or four sutures of this type may be necessary, the distance between sutures being ½ to 1 cm. When all the sutures have been inserted they are then tied off. This type of suture has two advantages: (1) it brings the depth of the wound into apposition and (2) it everts the edges of the skin thereby promoting healing. When the suturing is finished the wound may be painted with 1/1,000 acriflavine or smeared with B.I.P.P. On no account should bathing or dressing of the wound be recommended, in fact, one makes it a practice to leave it entirely alone after the operation for eight to ten days. When the sutures are removed, prognosis is excellent.

Fistula of the Teat

This may be congenital or acquired but in either case the result is the same: the milk escapes from a small orifice in the skin of the teat. Such cases should be dealt with when the animal is dry. The area to be operated upon is cleansed and anaesthetised and an elliptical piece of skin and subcutaneous tissue (like a segment of an orange) is removed by means of a sharp scalpel. The incision should be carried right down to the mucous membrane, and in most cases the long axis of the incision will correspond with the length of the teat. Occasionally, depending upon the position of the fistula, it may be at right angles to the length of the teat. The incision thus made should be closed by the type of suture already described. Sutures should be removed in 10 to 14 days.

Wounds

It would be impossible in a paper of this length to describe all the various types of wounding of the teats which may occur. The immense majority are caused by barbed wire and occasionally by treads from the cow in the adjoining stall or from the teats being trapped beneath the cow's own claws in attempting to rise. Such wounds may be incised or lacerated, are frequently contused and may or may not extend into the teat sinus with the escape of milk. I am of the opinion that all such wounds, after proper treatment, give better results if sutured than if left to their own devices. However, it must be remembered that dead or severely contused tissues should never be enclosed in a suture, and with this in mind one should remove all obviously dead or seriously damaged tissue before commencing to suture.

In every case treatment commences in the same way. The area is examined, the site of the anaesthetic is chosen, then cleansed and the anaesthetic injected. The damaged area is now thoroughly cleansed with soap and water, and the surgeon excises carefully and unhesitatingly all non-viable cellular tissues (debridement), noting particularly the capacity of the tissues to bleed.

1. Wounds not extending into the teat sinus. Many of these wounds, if small, incised and only superficial, undoubtedly will not require suturing, but where extensive and deep the teat should be anaesthetised and interrupted sutures inserted.

2. Wounds extending into the teat sinus with escape of milk. In this case the preliminary treatment is the same and the wound in the teat wall is closed by the type of suture described above for closure of teat wounds following removal of supernumerary teats and fistulae. The sutures should be placed fairly close together, *i.e.*, ½ cm. On no account should buried cat-gut sutures be used for suturing the mucous membrane: I have yet to see buried sutures produce anything but failure in teat surgery. The sutures tied, the wound is painted with 1/1,000 acriflavine or smeared with B.I.P.P. and not bathed or interfered with until eight to ten days later when the sutures are removed.

I have tried many ways of strapping teats with plain adhesive or elastoplast (plaster) but in my experience this method of treatment has proved unsuccessful.

The question now arises as to how to remove the milk from the affected quarter. Whenever possible the quarter should be milked by hand or by machine. If this is impossible, then, as a last resort, a milk syphon should be used. Careful instructions should be given the attendant as how to sterilise the syphon and how to ensure it is still sterile at the time it is inserted into the streak canal. The apex of the teat is cleansed with spirit before introducing the syphon.

Prognosis depends to some extent upon the time which has elapsed between the infliction of the wound or wounds and surgical treatment. Where the teat sinus has not been entered, prognosis is good. In cases where the teat sinus has been penetrated prognosis is not so good, but by following the technique described above the results are a considerable improvement upon older methods.

In the event of a fistula persisting after treatment, the animal should be milked until dry and then given appropriate surgical treatment.

Teat Obstructions

These may be congenital or acquired and may occur at the base, apex or in the middle of the teat.

Basal and mid-teat obstructions are almost invariably discovered immediately after parturition when it is found to be difficult or impossible to draw milk from one or more quarters. Examination of the affected quarter shows the sinus above the obstruction to be distended with milk. Cows which at one lactation have a single obstructed teat may at subsequent lactations have two, three or four teats obstructed. Routine examination of the other apparently non-obstructed quarters frequently reveals thickening in the mucosa of the teat sinus indicating the site of future obstructions.

1. *Basal Obstructions.*—These occur at the junction of the teat with the udder and may be congenital or acquired. Congenital obstructions at the base of the teat are seen in heifers and are the result of developmental errors. Such are generally membranous in form and should be dealt with in the same way as acquired obstruction.

Acquired obstructions are not infrequently seen in this position in cows, and often result from a localised mastitis present at the end of the previous lactation. It must be remembered that the cavity of the teat sinus is only a potential one in the dry cow. The inflamed surfaces are in apposition and as a result of adhesions partial or complete obstruction may ensue.

Membranous obstructions at the base of the teat are good surgical risks. If, however, as sometimes occurs, there is considerable thickening at the site of obstruction (sometimes this thickening is as large as a walnut), then it may be better to leave the obstruction alone.

2. *Mid-teat Obstructions.*—The aetiology is the same as for basal obstruction but I have yet to see a congenital mid-teat obstruction. All mid-teat obstructions encountered have been acquired. They appear to be very common at the narrow (waisted) part of so-called "bottled teats." The obstructions in this position may be partial or complete. When the former, a condition known as "waiting teat" is produced. In either case the treatment is the same. If, however, as in basal obstructions, there is considerable fibrosis at the site, then the condition will be best left alone. A knowledge of which teats to operate upon and which to leave alone can only be acquired

by experience but as a general rule one may say that where there is considerable thickening, then surgery should be approached with extreme caution.

Such obstructions are treated by means of Hudson's spiral teat instruments and probe. The instruments should be sterilised by boiling and brought to the scene of the operation in the container in which they have been boiled. The cow is restrained as previously described, preferably with the tail held vertically, and no anaesthetic is used. The apex of the obstructed teat is thoroughly cleansed with spirit. The straight probe is now passed up through the streak canal into the teat sinus until it encounters the obstruction. At this point, care should be taken to find the middle of the obstruction. When this has been determined, the probe is thrust through the obstruction. The probe is now withdrawn and one of the spiral instruments inserted into the streak canal and carefully screwed through. The spiral is passed up the teat sinus until the obstruction is encountered and an endeavour made to find the opening made in the obstruction by the probe. When the point of the spiral enters this opening, it is screwed through the obstruction. Now, with the teat in question held in the left hand, moderate downward traction is exerted on the instrument by levering the right hand against the left. This procedure prevents damage to the sphincter. If moderate traction fails to break down the obstruction, then the spiral should be unscrewed a few turns and a second attempt made. If this is successful, the instrument is again screwed into the obstruction and by a repetition of the previous procedure the obstruction is broken down. Some surgeons prefer to push the spiral upwards through the obstruction, but it is preferable to use downward traction except in cases where the obstruction is in the lower half of the teat sinus (between the mid-teat and the apex), when for obvious mechanical reasons, it is not possible to pull downwards on the instrument.

Prognosis is good, particularly in cases of membranous obstruction, but this prognosis depends upon the presence or otherwise of blood in the milk. Immediately after the operation, if haemorrhage is present, the prognosis is not good. but if there is no evidence of blood, then it is very good.

After-treatment consists in advising the man in charge to draw some milk from the quarter every six to eight hours for the next few days. On no account should so-called antiseptic teat bougies be used. If they are, then mastitis is almost certain to result. As a sequel, the obstruction sometimes recurs and the operation has to be repeated. Occasionally mastitis supervenes; not necessarily as a sequel to faulty technique, but as a result of stirring up an old focus of infection.

Apical Obstructions.—These may result from atresia of the streak canal, fibrosis, contagious black spot or contusion.

Atresia of the streak canal occurs very occasionally in heifers. Treatment consists of making the primary incision in the apex of the teat with a von Graafe's knife and completing the operation with a Maclean's knife which should be passed twice, the second incision being at right angles to the first. The only after-treatment necessary is to have a little milk withdrawn from the affected quarter every six to eight hours for the next few days. The condition appears to be more common in ewes than in cows.

Fibrosis of the apex may follow any inflammatory condition in this region and frequently results from wounding, treads, etc. The condition is recognised by the difficulty of forcing milk through the streak canal and the stream of milk becomes finer and finer at each subsequent milking until it is almost or quite impossible to force milk through the orifice.

Treatment consists of cleansing the apex of the teat with spirit and inserting a Maclean's knife which should preferably be kept in surgical dettol or spirit, since frequent boiling damages the cutting edges. The affected teat is grasped in the left hand, the probe point of the Maclean's knife introduced into the sphincter, and the knife thrust through. It is then withdrawn and re-introduced at right angles to the former incision. In some cases it may be necessary to introduce the knife three or even four times before an adequate flow of milk is produced. At first the milk will be found to spray considerably, but after two days this spraying diminishes. No after-treatment is necessary except the drawing of milk from the affected quarter every six to eight hours for the next few days.

Occasionally one encounters papillomatous-like growths in the streak canal, which obstruct the flow of milk and may sometimes be seen protruding from its external orifice. They may be dealt with by means of the papillotome or by incising the apex with the Maclean's knife.

Stinson's instruments may be used for any of the operations in which the Maclean's knife is used, but the latter instrument has largely superseded the former in recent years.

Contagious Black Spot

This is the name applied to an infectious condition caused by the *Fusiformis necrophorus* organism and which is characterised by the appearance of a black spot on the external orifice of the streak canal.

Symptoms.—The first symptom noticed is some slight difficulty in withdrawing milk from the affected quarter; at the next milking this is more marked and upon examination of the teat apex a small black spot (about the size of a pin's head) is seen, not unlike a spot of coagulated blood. At the next milking still more difficulty is experienced in withdrawing milk; in fact it may be impossible until the black spot, which by this time has increased in size, has been picked off. It must be remembered that, as the infected area increases in size over the skin of the teat apex, it also extends up the streak canal, and when once it has gained access to the teat sinus a very serious and sometimes fatal mastitis results.

Treatment consists in isolating the cow and operating on the affected teat with Maclean's knife. If teat bougies, or teat syphons, or "pieces of straw" have been used before veterinary advice is sought, then the owner should be warned that a serious mastitis will almost certainly supervene. Treated in reasonable time by surgical methods, and providing there has been no lay interference, then the prognosis is good. The after-treatment is the same as for other apical operations. Contusion of the teat apex is frequently responsible for obstruction here. The bruising results from treads by cows in the next stall or by the cow's own teat becoming trapped under her foot at the time of rising. This, of course, is most common in cows with very pendulous udders and large teats. The contused area may extend ½ to 1 in. up the teat from its apex. The affected area is swollen, hot, painful and, in non-pigmented teats, bluish black in colour. Treatment consists in endeavouring to reduce the congestion by fomentations, kaolin poultices, etc., but when no milk can be withdrawn, operation with Maclean's knife may be carried out. Frequently in these conditions this operation is not satisfactory and in order to obtain a flow of milk incision will have to be made with a scalpel or preferably a Bard Parker knife with a number II blade. This is introduced through the incision made by the Maclean's knife and an incision (or two) made from the centre outwards until a good flow of milk is obtained. In spite of the extent and the depth of the incision, provided only one incision is made or, occasionally, two, the results are satisfactory and the cow is not left with a permanent leaking teat. In a few cases of severely contused teats (in which the contused area extends a considerable way up the teat) no attempt has been made to withdraw the milk from the affected quarters for three to four days. The teat is poulticed with kaolin until the inflammatory process has subsided and if then it is still found to be impossible to withdraw any milk, operation with Maclean's knife should be carried out. It may sound surprising, but in the few cases in which this line of treatment has been adopted, the results have been promising. A course of sulphanilamide is given during the stage of poulticing.

Cows which run the milk (leaky teats) are encountered and from the farmer's point of view are very unsatisfactory, not only from the loss of milk, but because such conformation appears to predispose to mastitis. These cows can be improved by making a single incision with the Maclean's knife and milking only twice daily. The resulting scar tissue tightens the sphincter.

Occasionally one encounters obstructed teats which upon examination show a thickened, cord-like structure running the length of the teat from apex to base. Such cases are best left alone, surgical interference being both useless and dangerous.

Milk Calculi

These are concretions said to be formed in any part of the body and usually to be composed of inorganic salts. In my experience such conditions must be extremely rare if, indeed, they occur at all. I have never seen a true milk calculus, in spite of very many examinations and enquiries from my colleagues all over the country. On one occasion some twelve years ago I examined a recently calved cow for obstructed teat. The farmer stated that there was a small loose body in the teat which at times completely obstructed the flow of milk, but if he worked the object up the teat and held it there, he was able to withdraw normal milk. Upon the insertion in the teat of a sterile sound, a distinct metallic click was felt and I thought I had at last found a milk calculus. A crucial incision was made in the apex, extended further with a scalpel blade and the object forced out; it was a diabolo-shaped air gun slug.

The explanation must have been that someone had shot at the cow when she was dry (actually she had been dry for three months). The slug had entered into the galactophorous sinus without setting up an acute mastitis, and careful examination of the integument of the quarter failed to show any scar tissue indicating the point of entry of the slug.

Acknowledgments.—H. L. Foust, "Surgical Anatomy of the Teat of the Cow." T. Johnson, *J. comp. Path.* C. W. Ottaway (Personal communication). Sisson, "Anatomy of the Domesticated Animals." J. Taylor (Personal communication). J. G. Wright, "Veterinary Anaesthesia."

Discussion

(Central Veterinary Society)

Mr. Shenton, who opened the discussion, thanked Mr. Gold for a very interesting paper, and said that for the greater part he agreed with what the essayist had said. He then referred to two other conditions not mentioned, *viz.*, warts and teat amputation. Warts was a term embracing all conditions, from the few small excrescences on the udder itself, which were of no account, to huge growths with or without a pedicle. He found a large number of them easy to remove, but some, particularly when growing around the teat itself, especially when near the apex, were difficult to remove without causing deformity. In his experience the latter type were more common in heifers and in some instances he had found it necessary to wait until the animal had calved in order to differentiate between the wart and the teat. What method did Mr. Gold prefer for their removal? In his experience teat amputation was not often necessary, but in some cases of mastitis remarkable recoveries had occurred following this method of providing drainage.

Referring to Mr. Gold's method of casting, he preferred ordinary sidelines without the administration of a narcotic. He did not agree that sutured teat wounds should not be dressed for eight to ten days, and in view of the unhygienic environment, he advised immersing the teat in a jar of non-irritant antiseptic before and after milking.

Bearing in mind the enhanced value of cattle at the moment and considering the risk of mastitis following accidental injury or surgical treatment of the teats, did Mr. Gold advocate the use of M & B 693 with or without irrigation with one of the dye derivatives?

Whilst agreeing with Mr. Gold's classification of operable and inoperable cases of teat obstruction, he recommended frequent milking (not stripping) for the subsequent 24 hours. In his experience successful removal of a teat obstruction was frequently followed by a similar obstruction at the next lactation. Was this the fault of the operator or was it some intrinsic cause, as similar obstructions frequently occurred in the other teats?

When there was a cord-like obstruction throughout the length of the teat he did not recommend interference unless it be teat amputation.

In his experience antiseptic treatment as employed in other infections due to *B. necrophorus*, gave good results in the treatment of black spot.

He congratulated Mr. Gold on the way he had dealt with the anatomy of the udder and teats and described an instance where he had seen a cow which had two left teats fused together, with a septum extending two-thirds of the length of the teat.

Mr. Gold, in reply, agreed that it was sometimes very difficult to differentiate between warts and the teat itself and advised the removal with some type of Burdizzo. He did not use antiseptic teat bougies because he had great faith in the healing power of the animal, and if these antiseptics were sufficiently potent to do any harm to bacteria they were potent enough to harm the animal. For the same reason he did not like irrigating the teat with substances of the sulphonamide group. He advised the farmer not to milk the cow out but to take a few draws from the quarter two or three times a day, as raw surfaces might be in apposition and by this means occlusion would be prevented. To revert to the subject of teat bougies, he thought they were a noxious invention; they might set up a bad mastitis for which the veterinary surgeon was given the credit. Treatment of black spot by antiseptics might be effective but he had no faith in them.

Major G. E. Oxspring, thanking the essayist for a valuable and instructive paper, emphasised the importance of the selection of suitable cases for treatment. He only advised treatment of basal obstruction when the cause was a thin membrane as opposed to thickened mass tissue. He advised that Hudson's spiral instruments should only be used with gentle traction and mentioned an instance where the coil of the instrument had broken off, remaining in the sinus to cause an acute mastitis. Obstruction at the tip could easily be recognised by the "ballooning" of the teat and could be very successfully treated by using McClean's knife. Mr. Gold had previously demonstrated to him the special type of suture mentioned in his address and he had found the method very successful, in particular limiting the chance of infection after the removal of supernumerary teats. Teat wounds from barbed wire injuries were particularly common in his practice, and he agreed with Mr. Gold that the edges of the wound should be brought into apposition as far as possible. He accomplished this by cutting a strip of adhesive plaster a little shorter than the circumference of the teat, tied a strand of suture silk to each corner and after bringing the wound edges together applied the plaster over the wound, and tied the strands of silk. Plaster was more easily applied than suture and the animal did not resent handling the teat so much at subsequent milking. He preferred in most cases to use a local anaesthetic in teat surgery and found that a dental type syringe with a fairly fine and short needle was quite satisfactory for this purpose. It allowed better immobility than when not anaesthetised, which was essential in such delicate operations. He believed that an antiseptic of appropriate strength was a considerable advantage in the healing of teat wounds—he found a chlorine solution such as eusol very satisfactory.

Mr. Gold, replying, said that he was very interested in the question of adhesive plasters and sutures and he took it that the plaster was used when the wound penetrated into the deep structures and allowed the escape of milk. Referring to the use of local anaesthetics, he would like to know how the anaesthetic was to be introduced to enable the operation to be performed effectively; he thought that the infliction of two wounds was less painful than four to five insertions of the needle to inject the anaesthetic.

Major Oxspring thought that if one used a syringe with a very fine needle one could anaesthetise the end of the teat quite well and the anaesthesia was an advantage whilst performing the operation.

Mr. Scott Dunn, who also expressed his appreciation of Mr. Gold's paper, emphasised the value of operating in a cast position. He strongly deprecated the use of syphons and bougies. Referring to teat amputation, he advised the use of a small type of écraseur chain.

Mr. W. F. Barton congratulated Mr. Gold especially upon the manner in which he had dealt with the anatomy of the udder and teats. When he was at college this subject was grievously neglected. Many of those present had absolutely condemned the use of syphons and bougies because of the risk of mastitis. He himself rarely used them but he had known farms where syphons had been continually used by the farmer when, despite the lack of aseptic precautions, mastitis had never arisen. He wished to ask Mr. Gold about the treatment of the type of case in which the cow had had the end of the teat canal trodden on, as a result of which the teat canal was very inflamed and no milk could be obtained from the affected quarter. In his experience teat amputation was the best method of treatment. Referring to black spot, what treatment did Mr. Gold advocate when there was extensive ulceration on the teat?

Mr. Gold replied that he was afraid that Mr. Barton would not convert him to the use of teat bougies. When Mr. Barton referred to ulcers of the teat, was he including cow-pox? In such cases he did use antiseptics, despite his general objection to them, and he mentioned glycerine as being particularly valuable for promoting healing.

Mr. C. Formston queried the need for removing supernumerary teats except when they were abutting on to a main teat and there was a risk of fistula formation, and he emphasised the risk of their being hereditary. He agreed that wounds of the teat should be carefully sutured. Buried sutures were contra-indicated even though the material used was cat-gut. Silk should be avoided because of its capillary attraction. The best material both for superficial and deep suturing was silkworm gut. He had applied elastoplast in the nature of a finger stall after complete stripping, as suggested by Margarson, with the removal of the extreme end to expose the teat orifice. He had found it satisfactory for small lacerated wounds and it was certainly an excellent protective in wounds which did not penetrate the teat canal. Would Mr. Gold give his views on aetiology of occlusion of the duct? The teat, he said, is a structure which lends itself very readily to traumatism and from the anatomical description of Johnston and Faust, it can be appreciated that any inflammatory reaction is likely to produce tissue which reduces the potential cavity of the teat duct. Surgical intervention in many instances is likely further to increase the formation of granulation tissue.

Did hand milking and stripping predispose to teat lesions and was their incidence lessened by the use of milking machines?

Mr. Gold said another reason for removing supernumerary teats was the risk of mastitis in the small areas of gland tissue drained by some of these teats. He thought that occlusion of the teat was the result of a localised infection, adhesions between the inflamed areas which were in apposition resulting in obstruction.

Dr. Tom Hare, Dr. McCunn, Mr. C. W. Ottaway and Mr. L. Pitcher continued the discussion, and Mr. Gold replied to the points raised.

CLINICAL COMMUNICATION

Zinc Poisoning in Rabbits

NOEL ORMROD, M.R.C.V.S.

Woodchurch, Wirral, Cheshire

The rabbits about which my advice was sought were being bred in large numbers by an industrial concern in my district. They were intended for use as food in the works canteen to help out the difficult meat situation.

History.—The adult stock appeared healthy and in good condition. Good litters were produced, but as soon as the young rabbits were weaned they became unthrifty, gradually becoming worse until they died off four to six weeks after weaning. This state of affairs had been in existence for some time before I was called in and the losses had been very heavy.

Hygiene and general management were excellent. The hutches had wire floors and were cleaned out thoroughly each morning. Feeding and water utensils were scalded daily. Thus, since the oöcysts of eimeria require from two to ten days to become infective, coccidiosis, always the first suspect, was ruled out from the beginning.

Symptoms.—Apart from a slight and only occasional softness of the stools and the general unthriftiness of the affected stock, there was a complete absence of symptoms.

On the morning of my first visit eleven young rabbits had been removed from the hutches, either dying or already dead. These I took away for *post-mortem* examination.

Post-mortem Examination.—That night eleven very careful autopsies were performed and the lesions in all were remarkably similar. The livers showed slight fatty degeneration; there were fatty changes in the heart muscle and cloudy swelling in the kidneys. The stomachs were full and in each case the ingesta appeared to be wrapped in a tough sheet of mucus which came away easily from the stomach wall leaving the mucosa congested. Search was made in each case for coccidia but none were found.

Diagnosis.—I gave the opinion in my report that the deaths were due to a mild but persistent toxaemia, such toxaemia arising from (*a*) toxic ingredients of the food; (*b*) bacterial or virus infection; or (*c*) chemical poisoning introduced accidentally via the food or water.

Careful enquiry into the feeding ruled out (*a*). The general absence of symptoms and the excellent management made (*b*) appear unlikely. I decided to incriminate (*c*).

The manager of the rabbitry was not impressed, so I sought the specialised aid of a laboratory. One rabbit in a dying condition was submitted for examination. The report ultimately came along to the effect that the rabbit had died from a heavy infestation with coccidiosis!

Meanwhile I had again been prowling around the rabbitry and had discovered that vegetable scraps from the canteen were being cooked in galvanised buckets and that the spelter had been boiled off the insides of the buckets. Presumably the vegetable juices were sufficiently acid to act as a solvent on the spelter.

It appeared that zinc poisoning was the answer to the riddle.

Samples of the food were cooked in galvanised buckets and in iron pots. The firm's own chemists were able to establish the presence of zinc in the sample cooked in the galvanised buckets and its absence from that cooked in the iron pots.

A positive diagnosis of zinc poisoning was therefore given.

The manner of cooking the food was changed forthwith, when an almost immediate improvement was observed in the remaining young stock. This all occurred early in April, since when there has been no further trouble.

ABSTRACTS

[VITAMIN A DEFICIENCY NOT THE CAUSE OF JOINT LESIONS IN HORSES. Hart, G. M., Goss, H., and Guilbert, H. R. (1943.) *Amer. J. vet. Res.* **4**. 162.]

Two groups of horses selected for age and sex were used for the experiment. The control group consisted of three, the experimental group of seven. These were all fed a daily ration of from 16 to 22 lb. of food containing all vitamin requirements, although in the experimental group vitamin A was lacking. This group was, however, fed with alfalfa meal which has a high vitamin A content, up to the time the experiment commenced.

Night blindness developed in two of the animals on the deficient diet at nine and 17 months respectively after the vitamin had been removed from the ration. In both groups, however, shallow ulcers were observed on the articular surfaces of the joints.

In discussing the results the authors consider that there was no justification for the belief that vitamin A was the cause of the shallow ulceration observed, although they did consider it to be nutritional in origin. Further investigation suggested that the B complex was not completely represented, and this may have been a contributory cause.

Throughout the experiment the blood was examined at regular intervals for the presence of vitamin A and vitamin C, but even where the deficiency of vitamin A was fatal it was observed that the blood level of vitamin C was not seriously affected.

N. S. B.

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[OBSERVATIONS ON *Vibrio foetus* INFECTION IN CATTLE. Plastridge, W. N., and Williams, L. F. (1943.) *J. Amer. vet. med. Ass.* **102**. 89-95.]

The authors found that *Vibrio foetus* could be cultivated in a soft agar medium, consisting of liver infusion, 1 per cent. peptone and 0·3 per cent. agar with the *p*H adjusted to 7·4, if the cultures were incubated in an atmosphere of 10 per cent. CO_2. This medium was used for the production of antigen for agglutination tests. In the examination of nine abortions, five were detected by the direct microscopic examination of foetal stomach contents, six by cultural methods and eight by the agglutination test using serum from the aborting cow. All three procedures should be employed in diagnosis. From 237 cows in six infected herds 6·3 per cent. of sera caused agglutination in a dilution of 1/200 or higher. In six herds free from infection with *Vibrio foetus*, none of the samples from 322 cows caused agglutination in a dilution of 1/200. The authors consider that agglutination at 1/50 or less should be considered as negative, 1/100 as suspicious and 1/200 or higher as positive.

Abortions due to *Vibrio foetus* usually occur in the fifth, sixth and seven months of pregnancy. The infection in cattle appears to be self limiting, owing to the transitory nature of the disease and the increased resistance to subsequent exposure.

D. L. H.

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[PROGRESS REPORT ON IDIOPATHIC HAEMOGLOBINAEMIA IN CATTLE. Smith, H. C. (1943.) *J. Amer. vet. med. Ass.* **102**. 352-358.]

This article contains a description of a condition affecting beef cattle of all ages in the State of Oklahoma. It is characterised by rapid death, haemoglobinaemia and in many cases haemoglobinuria. The death-rate was 100 per cent. in untreated animals, and the morbidity rates varied from 5 to 35 per cent. The disease is compared with a number of other conditions in which haemoglobinaemia is a prominent feature. It is not related to the bacillary haemoglobinuria of cattle in Nevada caused by an anaerobe, *Cl. haemolyticum bovis*. No disturbance in the Ca : P ratio in the blood could be demonstrated, such as occurs in the parturient haemoglobinaemia of dairy cows. All attempts to reproduce the disease in laboratory animals and cattle failed, and no causative organisms could be demonstrated. Treatment with aricyl, an organic arsenic compound, yielded the best results.

D. L. H.

Weekly Wisdom

The great tragedy of science—the slaying of a beautiful hypothesis by an ugly fact.—T. Huxley.

* * * * *

Before the war 67 per cent. of the total (agricultural) output in England and Wales, and 80 per cent. of Scotland, was derived from livestock and livestock products. As a nation we are livestock-minded. Our country is suited to it. Our farmers are highly skilled in this type of farming, and livestock will again in peace-time be the sheet anchor of British farming.—Mr. Snadden, M.P.

QUESTIONS IN PARLIAMENT

Milk (Tuberculin-Tested and Accredited Standards)

Mr. Brooke asked the Minister of Agriculture what proportion of the total annual milk production in England and Wales is tuberculin-tested or accredited, respectively; and what proportion of the total passing into liquid consumption is sold under each of these designations?

Mr. Hudson: The proportions of the total annual sales of milk in England and Wales which are of tuberculin-tested and accredited standards are 6 per cent. and 35 per cent. respectively. The proportion of T.T. milk sold as such by wholesale is 22 per cent. I have no precise information as to the proportion of T.T. milk which is sold as such by producer-retailers. The quantity of milk sold under the accredited designation is, I understand, negligible.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Oct. 6th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 2.30 p.m.

Oct. 7th.—Annual Meeting of the Central Veterinary Society, Conway Hall, Red Lion Square, W.C.1, 2 p.m.

Oct. 7th.—Special Meeting of the South-Eastern Division, N.V.M.A., at Maidstone, 2.30 p.m.

Oct. 12th.—Special Meeting of the Royal Counties Division, N.V.M.A., at Reading, 2.15 p.m.

Oct. 15th.—Meeting of the Lancashire Division, N.V.M.A., at Preston, 2.30 p.m.

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N.V.M.A. Annual Meeting and Conference

As we go to press, members are in session on the first day of the sixty-first annual general meeting and conference of the National Veterinary Medical Association. The assembly of members and their ladies at the reception held by the President and Mrs. Wooldridge at the Waldorf Hotel last evening (Tuesday) was such as to give promise of a record "war-time" attendance. The proceedings will be reviewed in our next issue and a full account published in due course.

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R.C.V.S. OBITUARY

McDougall.—At Mossgrove, 95, West King Street, Helensburgh, on September 17th, 1943, James McDougall, M.R.C.V.S., husband of Elizabeth McDonald, and eldest son of the late John McDougall, M.R.C.V.S. Mr. Jas. McDougall graduated at Glasgow on December 16th, 1889.

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THE FUTURE OF THE MEDICAL SERVICES

At a meeting of the Council of the British Medical Association held on June 23rd last, the Chairman (Mr. H. S. Souttar) reported on the proceedings of the Representative Committee which had been in discussion with officers of the Ministry of Health regarding future medical services. He said that the Minister had agreed not to publish his White Paper upon which legislation would ultimately be based, until these discussions had been concluded. But the medical profession would have no responsibility for the White Paper, and would be in a position to criticise it in any way they wished. The Representative Committee was not a negotiating body. The discussions which had taken place had been of a non-committal character. The first thing which should now be done was for the Representative Committee to prepare a document which should be discussed at a special meeting to be called for July 28th. In reply to a resolution communicated by the Liverpool Division, the Chairman said that no assurance could be given that before any body was formed to negotiate with the Government ample opportunity would be given to Divisions and to the profession as a whole to elect representatives to serve on such a committee, but that the Divisions would have their opportunity through the ordinary constitutional machinery of the Association.

Bearing on the above, Dr. Charles Hill, Deputy Secretary of the Association, in the course of an address entitled "Medical Practice: In the Melting Pot?" delivered before one of the B.M.A. branches on July 8th, said that publication of the White Paper would be followed next winter by exhaustive and critical analysis of its contents by the medical profession, mainly through the Study Groups and Divisions, the Council and its Committees and finally the Representative Body of the Association. The problems that await decision following upon these exhaustive discussions within the profession are outlined (*B.M.J.*, 1943, July 17th, p. 83).

B.M.A. Opposition to "Salaried Branch of Government Service" Conception

The future of the medical services of the country provided the main subject for discussion at the annual representative meeting of the British Medical Association held recently at the headquarters in Tavistock Square, London.

Mr. Souttar, Chairman of the Council, in moving the adoption of the proposals on the future of medical services, as published in the annual report and the supplementary annual report in July and August respectively, said the medical profession in this country was faced to-day with the most important crisis in its history. Whatever might happen in the future the end of the war would close an epoch in the whole social life of the country, and with the closing of that epoch they might have to say good-bye to the world in which they had grown up and possibly to medical practice as they had known it.

Three years ago the Council realising what must lie ahead, determined to plan for the future. The Medical Planning Commission was formed, and in June, 1942, it produced a unanimous report, which was considered by all the constituent bodies of the Commission and by the Divisions of the Association, and met with a very gratifying general approval.

It was the intention of the Commission to elaborate its proposals, when there was suddenly launched a thunderbolt in the shape of the Beveridge Report. The proposals of that Report were for the most part admirable, and those that affected the medical profession were largely based on the accepted policy of the Association.

When, however, the Government set out to give effect to those proposals, a very different situation arose. Their axiom that a first-class medical service should be obtainable by every individual whatever his economic status was expanded into a proposition that no one was to pay for the service. Their desire to work together in groups was converted into regimented service under the local authority.

To discuss means for implementing the proposals in the Beveridge Report an authoritative body was formed which for four months discussed matters intimately with the Ministry. As a result they had reason to believe that the views of the Ministry had been greatly modified and that the proposals which would shortly be published in the White Paper were far more likely to meet with their approval.

The Association would be under no obligation to accept any single proposal the White Paper might contain. They had come to some definite conclusions, and these had been gathered together under the head of "general principles," which were now presented for criticism and, he hoped, approval by the members.

At the proper time, and when the White Paper had been published and fully considered, they would be asked to form a negotiating body to fill in all the details and prepare proposals for their final consideration. They were asked now to lay the foundations of the future medical practice of this country.

The conference, by an overwhelming majority, accepted a recommendation to the effect that it was not in the public interest that the State should convert the medical profession into a salaried branch of central or local government services, and that the State should not assume control of doctors rendering individual or personal health services.

A discussion on the free choice of doctor resulted in the passing of an amended recommendation that free choice as between doctor and patient should be preserved as a basic principle of future health services and no administrative structure should be approved which does not permit and encourage such choice. A further resolution was passed declaring that it was not in the public interest that the State should invade the doctor-patient relationship.

The meeting decided that the B.M.A. should seek to establish a corporate body and not a Government Department for the administration of a national medical service. [It is interesting to note that the B.M.A. now appears to have adopted a suggestion similar to that put before the National Veterinary Medical Association in the President's address last year.]

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Monday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal views of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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CALF VACCINATION

Sir,—The attempt on the part of officialdom to undermine the position of general practitioners grows apace. It is now proposed to carry out vaccination of calves against contagious abortion, by members of the Ministry's whole-time staff and by practitioners, at a fee of a shilling a head. No reason has been given the profession for this revolutionary proposal, but its intention is obvious and ominous.

In my opinion there is no need for calf vaccination to be undertaken by the whole-time staff, as practitioners are fully capable of meeting all such needs in the areas of their practices. The farming community is not composed of pauperised peasants and is well able and willing to meet the reasonable charges of practitioners. To accept a paltry fee of a shilling a head would be to prostitute our profession. The said community, as far as my knowledge of it extends, has not made any such request—why then does the Ministry?

Is it the Ministry's intention to depress the standard of remuneration until it ceases to give the practitioner sufficient margin of profit; and he, perforce, must throw up the work, leaving the field entirely open to the Ministry? The latter could then seek to justify its further incursion into general practice by saying that practitioners were unable or unwilling to co-operate in its schemes of control. The payment of tuberculin-testing serves as a pointer. Although, with the introduction of avian tuberculin, the work of testing was almost doubled, no increase in payment was ever made.

To impress a Government department against its inclination, the exercise of effective pressure or publicity is necessary.

The Ministry of Agriculture and Fisheries seems determined to encroach increasingly on the legitimate domain of private practice. Henceforth we shall need to be on our guard at every turn. Certain influence is bent on securing a veterinary State service pure and simple. The medical profession has seen the red light and is raising its voice against regimentation. If we neglect to do the same, unceasingly, we shall eventually find ourselves bearing a galling collar of State servitude.

Yours faithfully,

Long Planting, West Runton, Cromer, Norfolk. N. F. Pollock.

September 19th, 1943.

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"SHORTAGE OF VETERINARY ASSISTANTS"

Sir,—I was horrified to read the letter from Mr. Frank Chambers in which he recommends that the inspection of dairy herds should be dispensed with during the war. Personally I think that this policy would be disastrous. In fact I do not know of any work that is so urgently necessary, especially at the present time, as milk *free from disease germs* is of such vital importance and not too plentiful. I sincerely hope that neither the Minister of Food nor the Minister of Agriculture will see his letter.

Yours faithfully,

Clifford Manor, Stratford-upon-Avon. Graham Rees-Mogg.

September 19th, 1943.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Parasitic Mange*	Sheep Scab	Swine Fever
August 1st to 15th, 1943...	6	2	—	1	24
Corresponding period in—					
1942 ...	10	92	—	—	15
1941 ...	12	1	2	3	24
1940 ...	17	5	—	6	227
Total Jan. 1st to Aug 15, 1943	188	12	6	105	333
Corresponding period in—					
1942 ...	210	203	26	118	280
1941 ...	302	258	14	142	881
1940 ...	339	24	15	124	2,764

Note.—The figures for the current year are approximate only.
* Excluding outbreaks in Army Horses.